What is claimed is:

1. A double sided electrical interconnection flexible circuit, to enable interconnecting an integrated circuit chip to an external circuit, including:

a base dielectric film of a flexible polymeric material,

a conductor pattern on the first surface of dielectric film having a plurality of contact pads for interconnection from the chip terminals, interconnection between said pads, and from said pads to conductive vias through the film,

a plurality of solder ball contact pads on the second surface of the dielectric film patterned from an etched metal film matrix, and

a plurality of conductive vias, comprising metal studs etched from said metal matrix, which interconnect the conductors on the first surface to those on the second surface of said dielectric film.

2. The flexible circuit as described in claim 1 in wherein the metal matrix with etched studs comprise copper.

3. The flexible circuit as described in claim 1 wherein the etched studs everted from the metal matrix constitute a tool for punching a pattern of apertures corresponding to conductive vias in the dielectric film.

4. The flexible circuit as described in claim 1 which provides the interconnection circuitry for the substrate of an area array integrated circuit package.

5. The flexible circuit as described in claim 1 further including a plated copper layer disposed over the interconnect patterns and solder ball contact pads.

6. A flexible circuit as described in claim 5 which further including a plated layer of nickel and of gold over the conductor patterns and solder ball contact pads.

7. A flexible circuit as described in claim 1 further including a plurality of openings parallel to the film edges which correspond to a sprocket transport mechanism.

8. A flexible circuit as described in claim 1 wherein said base dielectric film comprises a polyimide polymer in the range of 0.003 to 0.006 inches thick.

9. A double sided electrical interconnection flexible circuit substrate for an area array integrated circuit package to enable interconnecting an integrated circuit chip to an external circuit including :

a base dielectric film of a flexible polymeric material in the range of 0.003 to 0.006 inches thick,

a conductor pattern comprising copper on the first surface of dielectric film having a plurality of contact pads for interconnection from the chip terminals, interconnection between said pads, and from said pads to conductive vias through the film,

a plurality of solder ball contact pads on the second surface of the dielectric film patterned from an etched metal matrix,

a plurality of solid conductive vias filled with metal studs comprising copper, etched from said metal matrix which interconnect the conductors on the first surface to those on the second surface of said dielectric film, and which constitute a tool for punching apertures in a pattern of conductive vias, and

a layer of plated copper disposed over said interconnect patterns and solder ball contacts, and a layer of nickel and gold over the plated copper.

10. A metal matrix embossing tool, comprising a copper film having a plurality of transverse studs.

11. A device as in claim 10 whereby said studs are punch tools for forming apertures in a dielectric film.

12. A device as in claim 11 whereby said studs are equal to or slightly greater in height than the dielectric film for a flexible circuit.

13. A device as in claim 12 whereby each stud on the embossing tool is adapted to simultaneously punch and fill the vias.

14. A device as in claim 10 wherein the unraised portion of the matrix adhered to the dielectric film and attached to the studs constitutes the base metal of a plurality of solder ball contact pads for a flexible circuit.

15. A method of manufacturing the metal matrix embossing tool as described in claim 12 including the steps of:

a. laminating a photoresist on each major surface of a metal matrix, comprising copper in the range of 0.003 to 0.006 inches thick,

b. aligning a photomask pattern corresponding to conductive vias in a flexible circuit to the first surface, exposing both surfaces with a strong uv lamp, and developing the unexposed resist,

c. etching the exposed copper to a thickness of about 0.0005 to 0.0015 inches in the etched area.

16. A method of manufacturing an intermediate base structure for a flex circuit including the steps of:

a. forming a plurality of apertures corresponding to a pattern of conductive vias in a flexible base polymer film having a layer of copper on the first surface by mating a metal matrix embossing tool as described in claim 10 to the second surface,

b. applying a force to said metal matrix so that the studs of the tool punch through the copper coated polymer film, thereby creating a plurality of vias filled with the studs, and attaching the film matrix to the second side of the flex film,

c. electroplating a thin film of copper onto both sides of the copper clad flex film.

17. A die plate mechanism, to facilitate punching apertures in a flex circuit film using studs etched from a metal matrix, including a relatively thin metal plate in the range of 0.004 to 0.010 inches thick having apertures precisely matched to said studs, and a relatively thick plate having larger apertures.

18. A method of manufacturing a flex circuit on a flexible base polymer including the steps of:

a. superimposing an embossing tool having a pattern of conductors and vias corresponding to a circuit design, wherein said raised areas are coated with a thin layer of metal, comprising copper,

b. applying heat and pressure to simultaneously emboss the film and to transfer said thin metal layer from the embossing tool to the dielectric film,

b. removing the embossing tool,

c. embossing a pattern corresponding to that of the second surface of a flex circuit, and simultaneously transferring a thin layer of metal into the embossed pattern,

d. physically removing the embossing tool,

e. plating a layer of copper to fill the vias and conductor patterns on both sides of the film, and

f. plating a layer of nickel and gold onto the exposed copper patterns.

g. applying a solder mask on the surface of the film surrounding the solder ball contact pads.

19. A method of making an embossing tool as in claim 18 wherein a thin layer of loosely held copper is selectively coated onto the raised areas of said tool by treating the raised areas with a thermoplastic adhesive and exposing to a suspension of copper powder.

20. An embossing tool, as in claim 18 wherein a thin layer of loosely held copper is selectively plated onto the raised areas of said tool.

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